

WATER QUALITY AND USE

Designated Beneficial Uses

At the recommendation of the Department of Natural Resources, the Missouri Clean Water Commission determines the quality of water necessary to attain designated “beneficial uses” on Missouri streams. Eighty-three miles of the North Fabius, 64 miles of the Middle Fabius, and 67 miles of the South Fabius rivers and the lower 3.5 miles of Troublesome Creek are designated for public drinking water supply (MDNR 1986a). All basin streams are designated for livestock and wildlife watering and protection of aquatic life. No streams in the basin are classified for whole-body contact recreation.

The primary deterrents to recreational use in the basin are high turbidity and siltation, which are direct results of poor soil management (MDNR 1986b). Excessive turbidity and siltation have not only decreased the abundance and diversity of aquatic life and habitat (Missouri Department of Conservation 1978), but have also made boating and canoeing more difficult due to locally heavy sedimentation. Stream channelization, which has also drastically reduced the amount and quality of aquatic habitat in parts of the basin, especially in the North Fabius River (Turner 1978), has affected recreational use by creating high banks and steep-sided channels where access is difficult. The lack of public access in parts of the basin also limits recreational use.

Chemical Quality of Stream Flow

Water quality data have been collected intermittently since 1972 at the South Fabius River gage station (USGS 1986, 1993; [Table 7](#)). A typical water year (1986) and a flood year (1993) were chosen for comparison. Both iron and manganese sometimes exceed secondary drinking water standards in the South Fabius River. Groundwater quality is considered poor throughout the basin due to high concentrations of dissolved solids and iron (MDNR 1986a, 1986b).

Water quality surveys were conducted in the Middle Fabius River, Troublesome Creek, and Grassy Creek by the Soil Conservation Service during 1975-1976 ([Tables 8 and 9](#)). Elevated levels of dissolved solids, ammonia, coliform, nutrients, and pesticides were recorded in these streams during 1975-1976. Total iron concentrations sometimes exceeded maximum drinking water quality standards for dissolved iron by a factor of ten or more. Presumably, much of the iron measured during these periods was attached to soil particles as insoluble ferric (Fe^{+3}) ions (Soil Conservation Service 1977). High levels of bacteria, suspended solids, and nutrients were usually associated with periods of high flow. Department of Conservation personnel collected water quality information from three sites in Troublesome Creek during 1988-1992 ([Table 9](#)).

Non-Point Source Pollution

Sedimentation and turbidity are the basin’s most severe water quality problems. Intensive crop farming and livestock grazing have caused severe soil erosion throughout the watershed.

Anderson (1980) reported 18-24 tons/acre/year of sheet and rill erosion from tilled land in the basin. Erosion from permanent pasture land averaged 5-9 tons/acre/year. Gully erosion in the drainage was among the most severe in the state, averaging 500-750 tons/square mile annually. As a consequence, the watershed delivered about 3.7 tons/acre of sediment to streams annually and was ranked the fifth worst of 45 basins in the state. Streambank erosion is also a problem in the basin. In the upper and lower Middle Fabius sub-basins, streambank erosion was estimated at 380 tons/square mile/year and 160 tons/square mile/year, respectively (SCS 1978).

Agricultural run-off, which includes fertilizer, pesticides, herbicides, and animal waste, also poses a significant threat to water quality in the basin. Excessive aquatic plant growth (mostly algae) has been observed periodically in several basin streams (MDC 1978). Although fish kills in the basin are uncommon, they usually can be attributed to low dissolved oxygen concentrations or high levels of ammonia entering the stream from animal feedlots or sewage lagoons.

Point-Source Pollution

Point-source pollution is low in the basin (Table 10). There are nine small communities that operate wastewater treatment facilities. Only three (Edina, Lancaster, and Memphis) discharge more than 0.06 MGD (million gallons daily) of sewage into receiving streams. Numerous small privately owned point-source discharges (mobile home parks, schools etc.) occur in the basin. Stormwater run-off from eight mining quarries and one petroleum storage facility are also potential point sources of pollution, but none have been linked to pollution events significant enough to cause a fish kill.

Concentrated Animal Feeding Operations

CAFOs are expanding in the basin, especially in the Troublesome Creek watershed, where they may have significant negative impacts on water quality. Currently, the only significant CAFO in the basin is a large dairy operation located in the Troublesome Creek watershed, Lewis County (s4 T60n R9w). Chronic releases of lagoon effluent from this facility directly into Troublesome Creek during the late 1990s may have caused significant damage to aquatic life.



Table 7. Select water quality data for the South Fabius River near Taylor, Missouri in 1986 and 1993 (from USGS 1986, 1993)

	STATE STANDARDS				WATER YEAR	
Parameter	I	III	VI	VII	1986	1993
Temperature (°F)	90° max				32-82 80	33- 80
Specific Conductance (μmhos/cm)					140-471 382	130- 382
pH	6.5-9.0				6.9-8.3 8.4	7.0- 8.4
Coliform, fecal (cols/100ml)	200 non- storm runoff				4 ^K -9,400 3,400 ^K	150-
Hardness, Total (mg/L as CaCO ₃)					100-210	54-180
Alkalinity, Total (mg/L as CaCO ₃)					50-184	40-154
Nitrogen, Ammonia (mg/L as N)	Depends on pH and temp				0.03-0.30 0.28	0.01-
Phosphorus, Total (mg/L as P)					0.05-0.30 0.27	0.08-
Manganese, Dissolved (μg/L as Mn)	50 50				6-250	47-56
Iron, Dissolved (μg/L as Fe)	1,000	300		300	<3-370	17-360
Solids, Residue Suspended (mg/L at 221 °F)					9-700 2010	<1-
Oxygen, Dissolved (mg/L)	5				6.4-13.5 14.6	8.6-
I: Protection of aquatic life III: Drinking water supply VI: Whole-body contact recreation VII: Groundwater ^K : Non-ideal count of colonies						

Table 8. A summary of water quality data collected in the lower Middle Fabius River and Grassy Creek during 1975 and 1976 (from SCS 1977).

Parameter	Middle Fabius (Range)	Grassy Creek (Range)
Temperature (°F)	52 - 81	48 - 77
Dissolved Oxygen (mg/L O ₂)	4.4 - 13.2	0.3 - 14.0
pH	6.8 - 7.7	6.5 - 8.0
Specific Conductance (μmhos/cm)	24 - 870	295 - 825
Turbidity (JTU)	5 - 94	5 - 150
Total Alkalinity (mg/L CaCO ₃)	112 - 226	72 - 355
Hardness (mg/L CaCO ₃)	129 - 350	130 - 430
Total Solids (mg/L)	173 - 1120	209 - 726
Dissolved Solids (mg/L)	2 - 414	185 - 585
Suspended Solids (mg/L)	5 - 870	1 - 277
Total Coliform (No./100 ml)	50 - 2100	150 - 88,000
Fecal Coliform (No./100 ml)	0 - 3400	0 - 8,700
Fecal Strep. (No./100 ml)	130 - 3600	90 - 20,000
FC/FS	0.00 - 5.00	0.00 - 8.60
Total Phosphate (mg/L PO ₄ -P)	0.09 - 1.60	0.00 - 9.70
Total Nitrogen (mg/L N)	<0.21 - 4.70	0.50 - 34.00
Ammonia (mg/L NH ₃ -N)	0.05 - 0.24	0.02 - 0.130
Nitrate (mg/L NO ₃ -N)	0.00 - 2.07	0.05 - 1.33
Nitrite (mg/L NO ₂ -N)	<0.002 - 0.130	0.005 - 0.130
Kjeldahl Nitrogen (mg/L N)	0.16 - 2.50	0.31 - 2.60
Total Iron (μg/L Fe)	180 - 3,640	500 - 7,300
Aldrin (ng/L)	<0.5 - 11.5	<0.5 - <2.2
Dieldrin (ng/L)	0.94 - 126	0.94 - 95
Endrin (ng/L)	<0.25 - <10	<0.25 - <10
<i>a</i> -BHC (ng/L)	0.29 - 38.8	0.31 - 25.2
<i>B</i> -BHC (ng/L)	<0.78 - <3.0	<0.78 - <3.0
Lindane, <i>Y</i> -BHC	<0.5 - 48.4	<0.51 - 29
Total BHC Fraction (ng/L)	<1.60 - 72.8	1.60 - 30.91

Table 9. A summary of water quality data collected in the Troublesome Creek watershed during 1975-1976 (from SCS 1977) and 1988-1992 (MDC).

Parameter	1975-1976 (Range)	1988-1992 (Range)
Temperature (°F)	54 - 90.5	35 - 88
Dissolved Oxygen (mg/L O ₂)	1.4 - 12.4	3 - 18
pH	6.3 - 8.4	7.0 - 9.8
Specific Conductance (μmhos/cm)	160 - 700	118 - 678
Turbidity (JTU)	3 - 150	<5 - 930
Total Alkalinity (mg/L CaCO ₃)	54 - 284	34 - 289
Hardness (mg/L CaCO ₃)	90 - 269	68 - 374
Total Solids (mg/L)	225 - 628	
Dissolved Solids (mg/L)	2 - 626	
Suspended Solids (mg/L)	2 - 439	
Secchi (inches)		2 - 36
Total Coliform (No./100 ml)	50 - 4700	
Fecal Coliform (No./100 ml)	10 - 15000	
Fecal Strep. (No./100 ml)	75 - 12000	
FC/FS	0.04 - 16.20	
Total Phosphate (mg/L PO ₄ -P)	0.01	
Total Nitrogen (mg/L N)	0.20 - 5.35	
Ammonia (mg/L NH ₃ -N)	<0.05 - 1.40	0 - 2.5
Nitrate (mg/L NO ₃ -N)	0.05 - 2.47	
Nitrite (mg/L NO ₂ -N)	<0.005 - 0.590	
Kjeldahl Nitrogen (mg/L N)	0.17 - 2.71	
Total Iron (μg/L Fe)	200 - 6,500	
Aldrin (ng/L)	<0.5 - 4.55	
Dieldrin (ng/L)	0.9 - 140	
Endrin (ng/L)	<0.25 - <10	
<i>α</i> -BHC (ng/L)	<0.31 - 108	
<i>β</i> -BHC (ng/L)	<0.78 - <3.0	
Lindane, <i>γ</i> -BHC	<0.50 - 20.0	
Total BHC Fraction (ng/L)	<1.60 - 112	

Table 10. Potential point-source pollution sites in the Fabius River basin as of 1999 (MDNR, unpublished). WWTF = Waste Water Treatment Facility.

Source	County	Location (S-T-R)	Receiving Stream
Baring N WWTF	Knox	s23 63n 12w	Trib. Bridge Cr.
Baring S WWTF	Knox	s26 63n 12w	Trib. Bridge Cr.
Downing WWTF	Schuyler	s28 66n 13w	Trib. N. Fabius
Edina WWTF	Knox	s18 62n 11w	N. Fk. S. Fabius
Knox City WWTF	Knox	s27 62n 10w	L. Troublesome Cr.
LaBelle WWTF	Lewis	s32 62n 9w	Trib. Reddish Br.
Lancaster WWTF	Schuyler	s19 66 14w	N. Fk. Middle Fabius
Memphis WWTF	Scotland	s17 65 11w	Gunn's Br.
Lewistown WWTF	Lewis	s17 61 8w	Trib. Middle Fabius

Sand/Gravel Quarry	Marion	s2 59n 6w	N. Fabius
Sand/Gravel Quarry	Marion	s24 59n 6w	Trib. S. Fabius
Sand/Gravel Quarry	Marion	s24 59n 6w	S. Fabius
Sand/Gravel Quarry	Lewis	s7 61n 7w	Trib. N. Fabius
Sand/Gravel Quarry	Lewis	s17 60n 7w	Trib. Middle Fabius
Sand/Gravel Quarry	Knox	s25 62n 12w	Rock Cr
Sand/Gravel Quarry	Knox	s23 60n 10w	Little Fabius
Sand/Gravel Quarry	Scotland	s22 64n 12w	Middle Fabius
Petroleum Storage	Marion	s26 59n 6w	Trib. S. Fabius